The Observability of the IGM with Constellation−X

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Constellation−X Facilities Science Team Meeting
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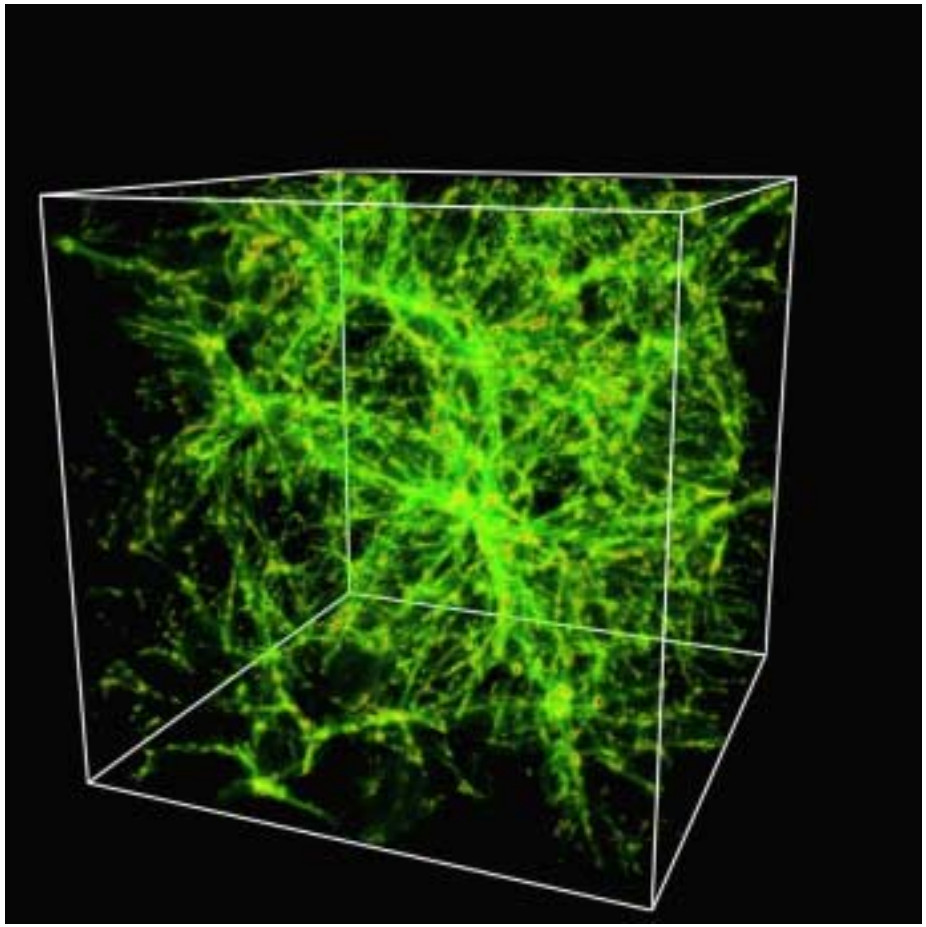
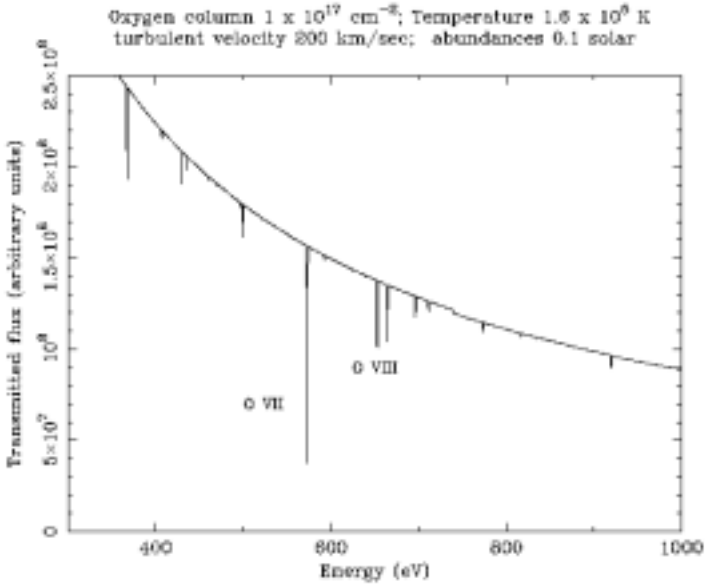
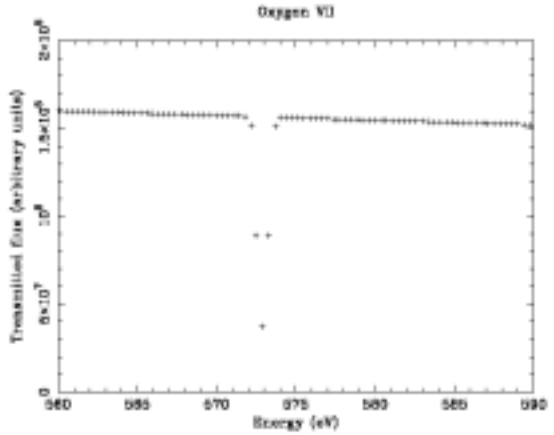


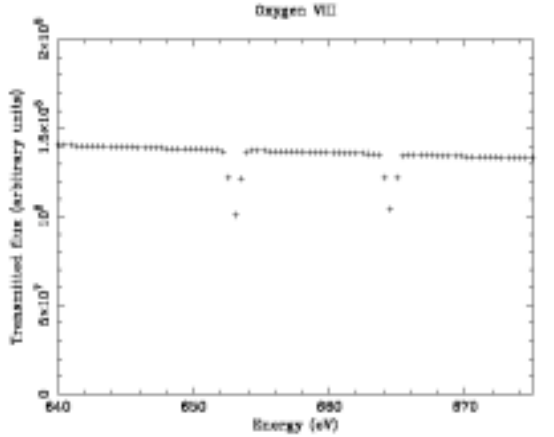
Gas simulations from R. Cen and J.P. Ostriker, Ap.J., 514, 1 (1999)

Radiative transmission models from XSTAR v2.1 (Tim Kallman, 2000)

Instrument properties from
http://constellation.gsfc.nasa.gov/science/matrices.htm
epoch June 2000







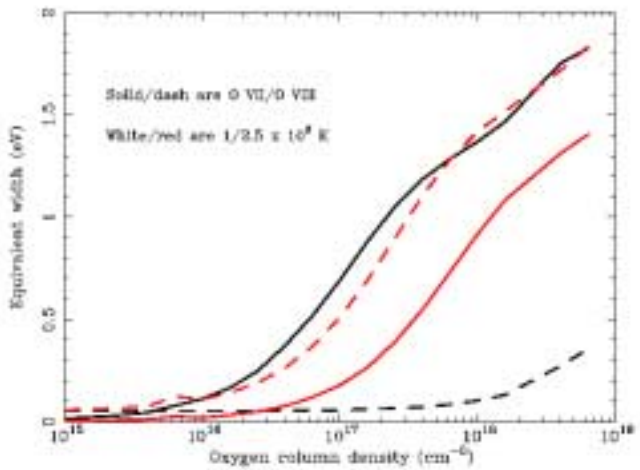
Relative transmission:

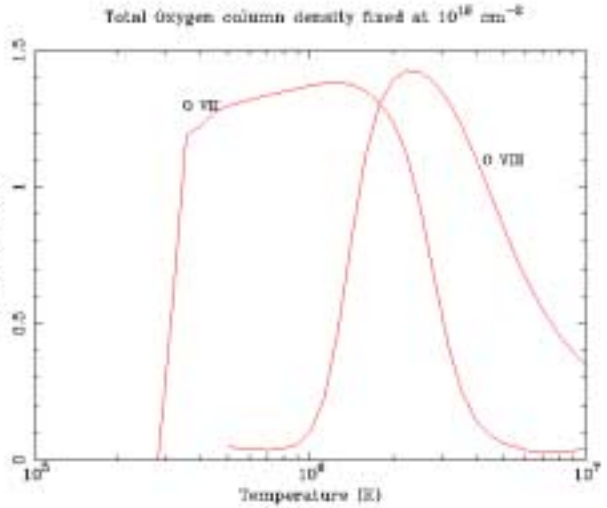
Temperature: 1.6 x 10^6 K (collisional equilibrium)

Turbulent velocity: 200 km/sec

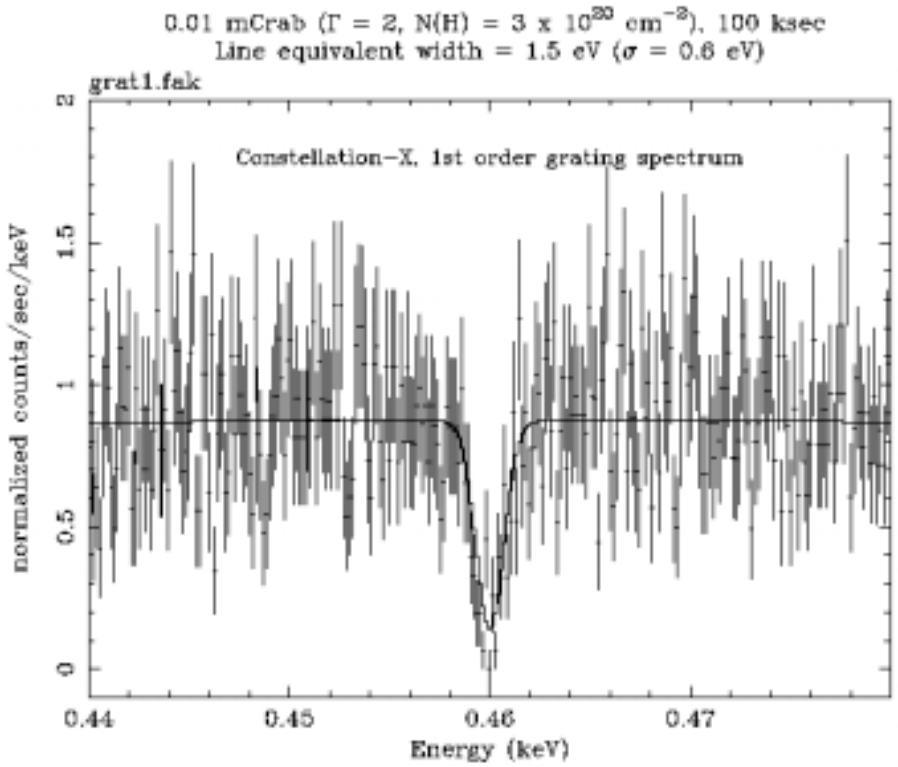
Energy resolution: 0.3 eV at 500 eV

Energy is shown in absorber frame





Equivalent widths near 1 eV are expected for (total) Oxygen column densities > 10^{17} cm^{-2}. Ratio of O VII/VIII provides temperature diagnostic. Turbulent velocites < 200 km/sec are harder to detect (barely resolved by Con−X).
Thermal velocity (for O) is ~ 40 $T_6^{0.5}$ km/s.

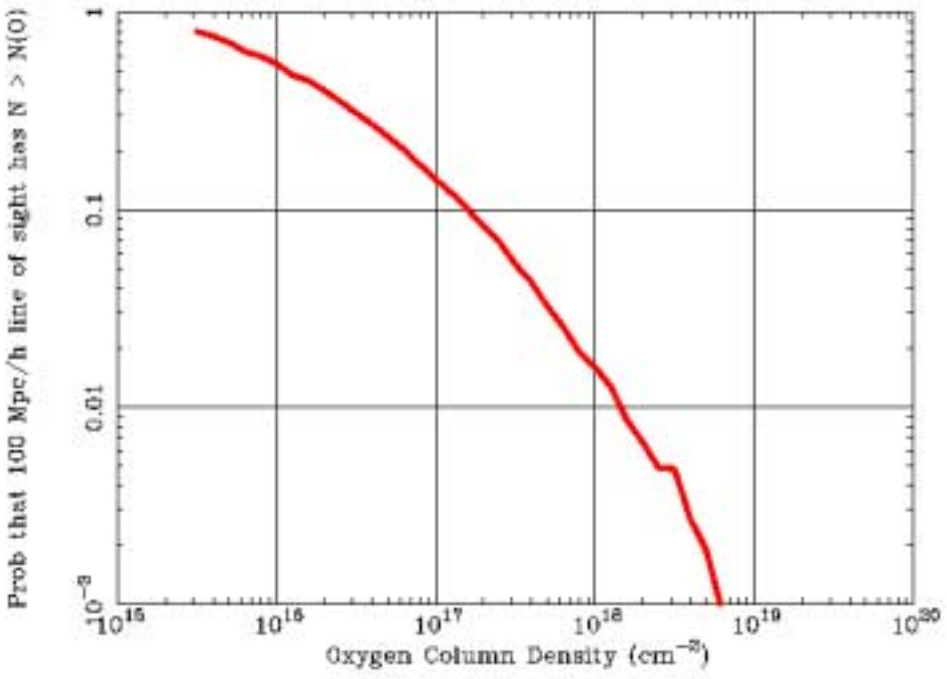


1.5 eV eq width line against 0.01 mCrab continuum, 100 ksec

Grating sensitivity is similar at energies from ~0.3 − 0.65 keV (i.e. $z < 0.5$)

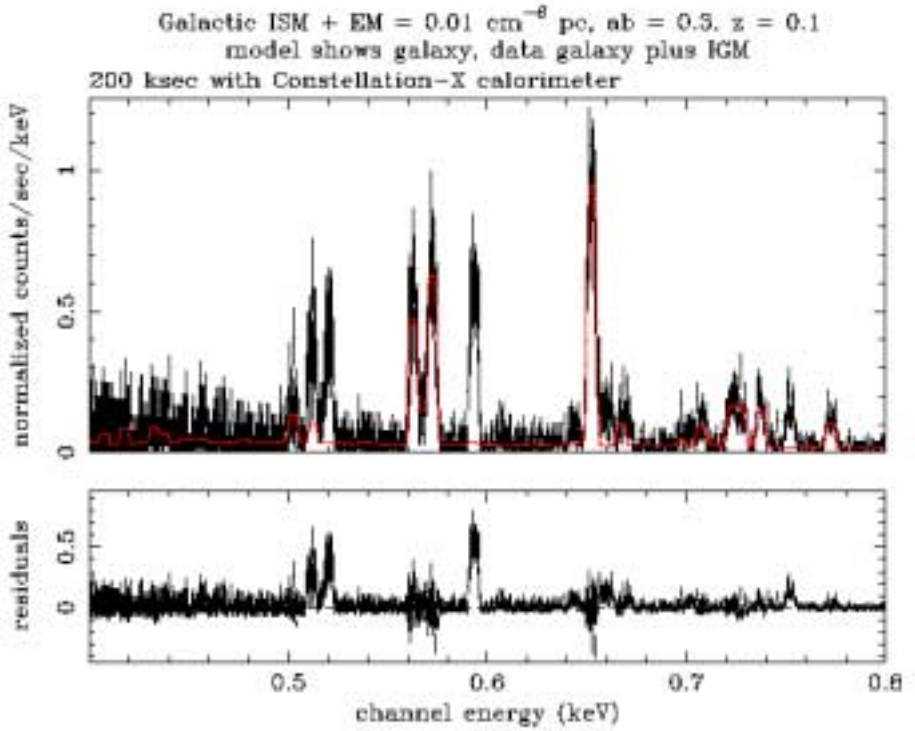
Signal: 85 ct/eV/mCrab/ksec

i.e. A 1 eV equivalent width feature removes 85 cts from a 100 ksec observation of a 2 x 10^{-13} erg/s/cm^2 source.



Total O column is estimated from contiguous "features".
Only gas with $0.3 < T_6 < 3.0$ included.

"All" $\Delta z \sim 0.5$ lines of sight have 10^{17} cm^{-2} feature;
60% have 10^{18} cm^{-2} feature

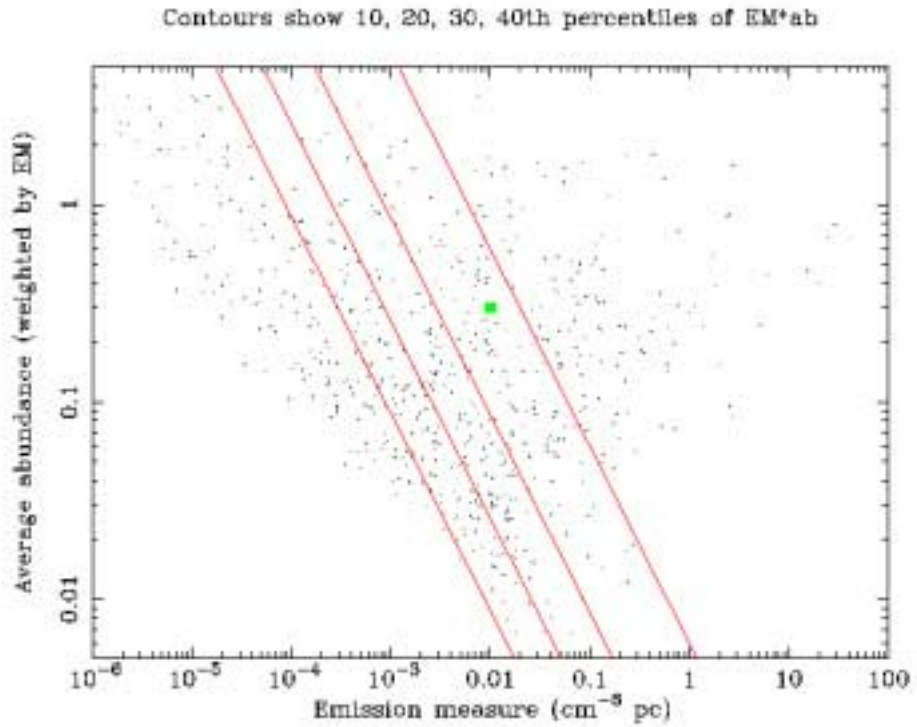


ISM background:

0.005 cm^{-6} pc @ 10^6 K
unabsorbed

0.005 cm^{-6} pc @ 3 x 10^6 K
10 E$^{-1.4}$ γ/sec/cm^2/keV/sr
absorbed by 3 x 10^{20} cm^{-2}

Simulated IGM has T_6 = 3.0, abundance = 0.1, z = 0.1



Simulation element fills Con−X field of view out to 225/h Mpc.

Beam dilution effects (and transverse extent of features) become important at larger distances

Distribution of Emission measure and <abund> for material with $0.3 < T_6 < 3.0$ along 100 Mpc/h line of sight. 47% of sight lines are "empty".

Green marks location of spectral simulation